Foundations of Statistics – Week 4 Tutorial

z-scores and Probability

# Learning Objectives

* Be able to calculate and interpret z-scores
* Be able to calculate and interpret probabilities

# The Normal Distribution

IQ scores are normally distributed with a mean μ=100 and standard deviation σ=15

z =

What is the z-score corresponding to an IQ score of 82?

* z-score: -1.2. This means that an IQ score of 82 is 1.2 standard deviations below the mean.

What is the z-score corresponding to an IQ score of 138?

* Z-score: 2.533. This means that an IQ score of 138 is 2.533 standard deviation above the mean

Suppose **your age** is 2.7 standard deviations below the mean [ie z-score = - 2.7]. This means that:

1. Your age is above average but not unusual
2. Your age is below average, but you’re not unusually young
3. **You are unusually young**
4. You are unusually old

Suppose **your age** is 0.8 standard deviations above the mean [ie z-score = 0.8]. This means that:

1. **Your age is above average but not unusual**
2. You are unusually young
3. Your age is below average, but you’re not unusually young
4. You are unusually old

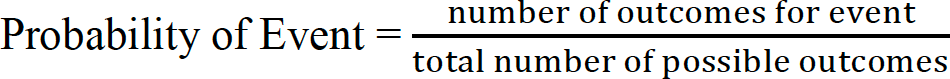
Suppose **your age** is 3.1 standard deviations above the mean [ie z-score = 3.1]. This means that:

1. Your age is above average but not unusual
2. You are unusually young
3. **Your age is below average, but you’re not unusually young**
4. You are unusually old

If the mean age of a population is 34 years with a standard deviation of 3.5 years [***µ*** = 34, ***σ*** = 3.5], calculate the actual age for the z-values used above [ **- 2.7, 0.8, 3.1**]. Round to the nearest whole year.

The formula for this calculation is: ***X = µ + zσ***

# Probabilities:

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You’ve been given a packet of M & M’s, but you are not allowed to eat any until you have completed the following table [use four decimal places for probabilities and two decimals for percentages]:

|  |  |  |  |
| --- | --- | --- | --- |
| **Packet of M & Ms** | | | |
| **Colour** | ***f*** | **Probability of selecting this colour Calculation** | **Probability Percentage** |
| Red | 11 | *p*(Red) = 0.1375 | 13.75% |
| Orange | 12 | p(Orange) = 0.15 | 15% |
| Blue | 20 | p(Blue) = 0.25 | 25% |
| Green | 11 | p(Green) = 0.1375 | 1.75% |
| Yellow | 18 | p(Yellow) = 0.225 | 22.5% |
| Brown | 8 | p(Brown) = 0.1 | 1% |
| **Total** | 80 |  |  |

What is the probability of selecting an M & M that is *either* Green *or* Yellow?

0.3625 => 36.25%

What is the probability of selecting an M & M that is *either* Orange *or* Red?

0.2875 => 28.75%